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REMARKS

Applicants acknowledge the objection to the drawings set forth in paragraph 3 of the Office Action. In particular, the Office Action states that the drawing fails to show the feed line 14 as connected to the gas generator 9, as described in the specification. In response to this ground of objection, Applicants respectfully submit, however, that the drawing in correct in its present form.

The reference to "feed line 14" in paragraph 3 of the Office Action is not understood, in that the reference numeral 14 applies to the cathode exhaust line, as indicated in paragraph [0020]. The drawing correctly shows the cathode exhaust line 14 as being connected between the fuel cell 10 and the heat exchanger 7, as indicated in the first two lines of paragraph [0021]. On the other hand, the term "feed line" is used in the application only to designate the feed line 11, which is connected between the gas generator 9 and the fuel cell 10, as correctly shown in the drawing. Accordingly, Applicants respectfully traverse the objection to the drawing. If the Examiner remains of the opinion that a correction to the drawing is necessary, further clarification is requested.

Claim 4 has been rejected under 35 USC §112, second paragraph for failing to particularly point out and distinctly claim the invention, based on a formal issue cited by the Examiner in paragraph 6 of the Office Action. In particular, it is noted that the word "coolant" in line 2 of Claim 4 has no

antecedent basis. In response to this ground of rejection, Applicants have amended Claim 4 in a manner which addresses and is believed to resolve this issue.

Claims 1-11 have been rejected under 35 USC §102(e) as anticipated by Wheeler (U.S. Patent No. 6,277,509). However, for the reasons set forth hereinafter, Applicants respectfully submit that all claims of record in this application distinguish over the Wheeler reference, whether considered separately, or in combination with other references. In addition, Applicants have also added new Claims 12 and 13, which are believed to distinguish over the references for the same reasons.

The present invention is directed to a method and apparatus for recovering water from a vehicle electric generating system, such as a fuel cell, which outputs a hot exhaust gas stream that includes water vapor. Virtually all internal combustion engine driven vehicles include a vehicle radiator system, and most vehicles today include an air conditioning system; both such systems include a cooling circuit that has a high capacity for heat transfer. Therefore, according to the present invention, an efficient, simple and inexpensive water recovery system can be provided for the fuel cell by coupling the exhaust gas stream of the fuel cell system in heat transfer relationship with the cooling circuit of the vehicle radiator or the vehicle air conditioning system, via a heat exchanger. This arrangement provides a capacity to cool the exhaust gas stream from the fuel cell to a very low temperature, such as is required to condense

efficiently the water contained therein. The high cooling capacity and the low temperature of the vehicle radiator and air conditioning cooling circuits insures that the amount of water recovered is sufficient for operation of the fuel cell system, providing a positive water balance.

Like the present invention, the Wheeler apparatus is directed to a water recovery system for a fuel cell power plant. For this purpose, the fuel cell system includes its own heat exchanger circuit which includes a hydride bed cooler for cooling the exhaust gas streams from the cathode and anode chambers of the fuel cell. In addition, a separate coolant loop is provided for cooling the fuel cell generally.

In particular, referring to Figure 1 of the Wheeler patent, it can be seen that the fuel cell (indicated generally by the arrow and reference numeral 12) includes a PEM membrane 14 sandwiched between an anode electrode 16 and a cathode electrode 18. An anode flow field 28 is associated with the anode electrode, and a cathode flow field 36 is provided in contact with the cathode electrode. A coolant transport plate 20 is provided for cooling the fuel cell itself. (See generally, Column 6, lines 26-59.)

The "coolant loop" which circulates a coolant to the coolant transport plate 20 includes a coolant reservoir 28, from which coolant flows via a first coolant feed line 48, a heat exchanger 52 and a second coolant line 54 to the coolant

transport plate. Effluent from the latter is circulated back to the coolant reservoir 46 via a pump 50 and a coolant loop return line 56.

In addition, the cathode exhaust stream 38 and the anode exhaust stream 30 from the respective cathode and anode flow fields in the fuel cell are guided to a process exhaust passage 40, which leads to the hydride bed cooler 84 provided for cooling the process exhaust gas stream, as indicated at Column 8, lines 17-19.

The cooling operation of the hydride bed cooler 84 is described in the specification at Column 9, line 18 through Column 10, line 52. The hydride bed cooler 84 includes first and second redundant pairs of high and low temperature beds. The reason for this arrangement is that while one of the two pairs is operating in a regenerative mode (a process which requires the input of heat, as described at Column 9, line 63 through Column 10, line 10), the second is operated in a cooling mode. As noted at Column 10, lines 43-46, with the operation of the system over time, the amount of hydrogen that can be desorbed from the second low temperature condensing bed 96 is exhausted, and the temperature of the process exhaust stream exiting the bed 96 gradually increases, so that the amount of condensed water directed to the bed from the coolant 44 decreases. For this reason, as illustrated in Figure 2, an arrangement can be provided in which the regeneration and cooling functions are periodically alternated between the first pair of hydride beds 86 and the second pair of hydride beds 88.

As can be seen from the foregoing brief description, the Wheeler reference differs fundamentally from the present invention as defined in the claims, in that the fuel cell system provided there, like most fuel cell systems, utilizes its own dedicated cooling circuits and heat exchangers for cooling the effluent exhaust gas stream from the fuel cell. In this regard, it should be noted, however, that Claim 1, for example, specifically recites that "a cooling circuit of one of a vehicle radiator and a vehicle air conditioning system is coupled via a heat exchanger to at least one exhaust gas stream of the electrical/fuel cell system". The Wheeler reference neither incorporates nor refers to a cooling circuit of either a vehicle radiator or a vehicle air conditioning system. Rather, the hydride bed cooler 84 is used to condense water from the hot exhaust gases. Thus, Wheeler fails to teach or disclose a feature of the invention which is recited in each of independent Claims 1, 7, 9 and 13. Applicants, therefore, respectfully submit that all claims of record distinguish over Wheeler.

Paragraph 8 of the Office Action states that the Wheeler reference discloses a water recovery system for a fuel cell for powering a "motor or battery 42". The specification indicates at Column 7, lines 9-10, however, that the component 42 (which is indicated by a symbol conventionally used to designate a resistance) is "an electricity using device 42 such as an electric motor". In fact, insofar as Applicants have been able to determine, the apparatus in Figures 1 and 2 of Wheeler nowhere contains a battery. The motor 42, on the other hand is clearly incapable of storing energy in the manner of a battery.

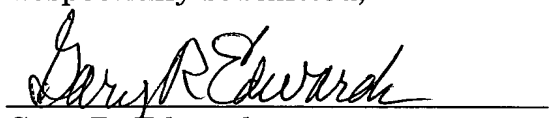
The latter distinction is significant with regard to Claim 12, which recites a method of operating a device for recovering water from an electrical/fuel cell system in a vehicle, in which the fuel cell is operated when the temperature in the cooling circuit (discussed previously) is below a preset value, and during periods when the temperature and the cooling circuit exceeds the preset value, power is supplied from the electric energy accumulator. Whether or not it may be said that a conventional fuel cell system, such as illustrated in Wheeler, would ordinarily be expected to include an energy accumulator such as a battery, the Wheeler reference contains no suggestion of the operating method recited in Claim 12. Claims 15 through 19 in particular which are referred to in the Office Action, are directed to the alternate operation of the first and second pairs of hydride beds 86, 88 in Wheeler in the regenerative and cooling modes. Thus, these claims are unrelated to the method according to the invention in which the fuel cell itself is operated only when the temperature of the cooling circuit is below a preset value, with energy being provided from a battery in the interim periods. The Wheeler patent indeed contains no discussion of operating the fuel cell itself intermittently in this manner or in supplying energy from a battery (none being provided in Wheeler) during periods when the fuel cell is not operating. Accordingly, Claim 12 distinguishes for this additional reason as well.

In light of the foregoing remarks, this application should be in condition for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the application in general,

a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #225/49631).

Respectfully submitted,



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